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Manufacturer–Supplier relationships and service performance in service triads

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Abstract

Purpose
This study explores the role of the manufacturer–supplier relationship in service performance within service triads.

Design/methodology/approach
An abductive case-research approach was adopted, using three embedded cases and twenty-six interviews in complex, multilevel manufacturer–supplier relationships within the same service network. Cannon and Perreault's (1999) multidimensional relationship framework was deployed to achieve granular and nuanced insight.

Findings
This study corroborates the idea that relational relationships within service triads and servitization improve performance. The role of each relationship dimension in service performance is discerned, and their interplay is captured in an analytic model. Information exchange, supplier relationship-specific adaptations, and the degree of formalization of the relationship directly influence performance, while cooperative norms and operational linkages are further back in the causal ordering. The study also highlights the importance of contingent factors and how they affect the relationship dimensions.

Research limitations/implications
The work was conducted in one network and the findings were generalized to theory rather than additonal empirical settings.

Originality/value
This study is the first to derive a contextualized causal ordering of the Cannon and Perreault (1999) framework of relationship connectors and link it with service performance.

Keywords: Service triads, Service performance, Relationship Influences, Abductive Case Study.

1. Introduction

In Business-to-Business (B2B) settings, a manufacturer adopting a service-based business model (e.g., servitization – Baines et al., 2009) often assigns service delivery to suppliers (e.g., Cohen et al., 2006; Van der Valk and Van Iwaarden, 2011). Thus, the manufacturer, its customer, and the service supplier become interlinked. Each actor has direct contact with the other two, forming a service triad (Wynstra et al., 2015). In such structural arrangements, an actor can influence (and be influenced by) the relationship between the other two actors (e.g., Choi and Wu, 2009). An implication of this interdependence is that the supplier, with its service performance towards the customers, can affect customer satisfaction, and consequently, the manufacturer–customer relationship and customer loyalty (Li and Choi, 2009). Hence, ensuring that the supplier performs to desired standards becomes an issue of importance to the manufacturer (Pawar et al., 2009).

Prior research into service triads has examined pure service settings such as restaurants or IT outsourcing (e.g., Autry et al. 2014; Li and Choi, 2009). It has also researched relationships in servitized contexts, but without considering the implications for service performance (e.g., Bastl et al., 2012). The intent of this study is twofold. Firstly, to determine the role of the manufacturer–supplier relationship in the supplier's service performance towards the manufacturer's customers. In doing so, this work studies a dyad within a triad (Wu and Choi, 2005, Wynstra et al., 2015), where the third actor (i.e., the customer) is affected by the relationship dynamics between the manufacturer and the supplier. Secondly, to generate a nuanced and granular account of the roles of the individual dimensions of manufacturer–supplier relationship. This extends prior research in service triads that has tended to adopt a binary classification (e.g., transactional or relational) of relationships (e.g., Wuyts et al., 2015). To do this, the Cannon and Perrault (1999) framework of relationship connectors is adopted.

This study makes the following contributions. First, it substantiates that relational relationships within service triads improve service performance of the supplier to the customer (*cf.* Peng et al., 2010). Second, it unveils contingent factors that influence the relationships within the service triads being studied adding greater theoretical nuance to the extant literature. Third, it answers the call by Cannon and Perreault (1999) to qualitatively understand *how* the relationship connectors are ordered, by discerning the individual role of each relationship connector and their contextual determinants. This is important as it indicates that the contingent

factors and some connectors are antecedents of other connectors, and they combinatorially lead to improved service performance.

The remainder of the paper is structured as follows: the literature review covers service performance, servitization and service triads, and introduces Cannon and Perreault's (1999) framework of relationship connectors. The methodology section presents a detailed account of the design and execution of this study. This is followed by the presentation of the within and cross-case analyses, the model that emerges from the cross-case analysis, and finally, the discussion and conclusions.

2. Literature review

2.1 Service performance and the influence of inter-firm relationships

The nature of a Buyer–Supplier relationship affects the supplier's service performance. For example, practices that foster supplier partnering and closer customer relationships enhance a firms' service performance (Droge et al., 2012). Where there is service co-production between personnel from the two parties, close interpersonal relationships foster the development of cooperative norms, and safeguard against hazards that are poorly predicted in explicit contracts (Guo and Ng, 2011), resulting in service performance improvements. Similarly, a positive association between relationship characteristics (e.g., trust, commitment, asset specificity, information sharing) and a firm's operational or relationship performance has been found (Handfield and Bechtel 2002; Yigitbasioglu, 2010; Wacker et al., 2016;). Such constructs often encompass aspects of service performance such as customer service support and service quality improvements (e.g., Cai et al., 2011). Moreover, there is evidence of bidirectional causality – or the relationship–performance spiral (Autry and Golicic, 2010). Over time, the association between relationship strength/quality and performance is cyclical, whereby the relationship strength/quality is both a precondition and an outcome of performance. Similarly, the association between relationship dimensions such as trust, transparency, communication intensity and openness has been argued to be cyclical, impacting business performance through feedback loops (see: Akkermans et al., 2004). Thus, a firm's service performance is often a function of the characteristics of its inter-firm relationships. There is a need however to discuss this relationship further in the context of servitization and service triads.

2.2 Servitization and service triads

The effective provision of servitized offerings is a collective effort by manufacturers and their external partners (Lockett et al., 2011; Benedetti et al. 2015). When service delivery is assigned to independent suppliers, a "service triad" is formed (Wynstra et al., 2015). For example, Caterpillar uses independent dealers to provide customer service support (Fites, 1996), and Cisco relies on suppliers to service its equipment at its customers' sites (Cohen et al., 2006). Services are inseperable (Sampson and Froehle, 2006), therefore the service supplier has to interact with the customer when delivering the services (Li and Choi, 2009; Finne and Holmström, 2013). Hence, service triads in B2B contexts are transitive by nature, i.e. the triadic actors (manufacturer, customer and service supplier) form and maintain direct ties between themselves (Wynstra et al., 2015).

Due to the interdependence between actor performance and the nature of the dyadic relationships within service triads (Hartmann and Herb, 2015), an actor (e.g., the manufacturer) can be influenced by an indirect relationship (between the service supplier and a customer) and vice versa, while a relationship (e.g., manufacturer–customer) can influence another relationship (manufacturer–supplier). Thus, in the context of servitization, the effective provision of the offering, customer satisfaction and loyalty to the manufacturer, depend on the performance of the supplier responsible for the delivery of the services (e.g., Li and Choi, 2009; van der Valk and van Iwaarden, 2011). Therefore, the performance of the actors in service triads will depend on the nature of relationships between them. For instance, coordination mechanisms such as formal contracts, coupled with trust, elicit higher cooperative performance when compared solely to market (i.e., price) mechanisms (Peng et al., 2010). A relational relationship between the manufacturer and the service supplier also enhances the customer focus of the supplier, improving its customer service performance (Wuyts et al., 2015). For the provision of solutions trust, relationship adaptations, aligned incentives, operational integration, risk-sharing agreements, and intense and diverse information sharing between the partners are increasingly important (Lockett et al. 2011; Bastl et al., 2012).

The extant research on service triads has taken place in pure service contexts as opposed to contexts where there is product–service integration (Li and Choi, 2009; Autry et al. 2014). Furthermore, other studies on servitization do not examine the implications of relationships on service performance explicitly (Peng et al., 2010; Bastl et al., 2012). Finally, researchers tend to

selectively focus on particular aspects of the relationship, such as cooperation or governance mechanisms, or adopt a "blunt" distinction between relational and transactional relationships (*cf.* Mena et al., 2013). The next section introduces Cannon and Perreault's (1999) framework of relationship connectors, which this study adopts to provide a more holistic and multidimensional view of manufacturer–supplier relationships.

2.3 Cannon and Perreault's framework of relationship connectors

The adoption of Cannon and Perrault's (1999) framework follows an established tradition in the Operations and Supply Chain Management field of treating inter-firm relationships as a multidimensional construct (e.g., Ellram and Hendrick 1995; Autry et al., 2014). Rooted in a number of broader theories (social exchange theory, transaction cost economics and resource dependence theory), the framework suggests that an inter-firm relationship is formed of five relationship connectors, defined as, "dimensions that reflect the behaviours and expectations of behaviours in a buyer-seller relationship" and "reflect the manner in which two parties interrelate and conduct commercial exchange" (Cannon and Perreault 1999, p.441). The connectors, their original definitions, and a summary of their role, are included in Table 1.

----------Insert Table 1 approximately here----------

There are several reasons for adopting this framework. First, a buyer–supplier relationship is a complex system of multiple, rich, interpersonal interfaces (Ellram and Hendrick, 1995). Thus, the dimensions of the relationship emerge over time as a result of the experience and outcomes of ongoing interaction (Ritter et al., 2004). The complexity and repetitiveness of interactions are more strongly manifested in servitization, where long-term, interdependent, multifaceted relationships are the norm, and high levels of information and knowledge exchange are required (e.g., Johnson and Mena, 2008; Bastl et al., 2012). As the connectors capture unique information, the individual role of each in the performance of the service supplier is disentangled.

Second, in contrast to high-order elusive concepts such as commitment and trust, the relationship connectors are closely anchored in day-to-day business activities. Simultaneously,

they are closely related to, or reflect such abstract theoretical concepts. Thus, the framework neither lacks explanatory power, nor relevance to buyer–supplier relationship research.

Third, studies have selectively adopted Cannon and Perreault's (1999) connectors, but few have employed the framework in its entirety (*cf.* Penttinen and Palmer, 2007; Saccani et al., 2014;). Additionally, the framework has been used to study servitization and service triads specifically, due to its holistic nature (*cf.* Penttinen and Palmer, 2007; Bastl et al., 2012; Autry et al., 2014). None of these works, however, has focussed on the interplay between connectors and their implications for service performance, despite the call by Cannon and Perreault (1999) and Bastl et al. (2012) for further research.

This work satisfies the following objectives: First, to understand the role of the manufacturer–supplier relationship in the service performance of the supplier towards the manufacturer's customers. As such, this work studies a dyad within a service triad and its service performance implications. Second, to determine the role of, and interplay between, Cannon and Perrault's (1999) relationship connectors in a manufacturer–supplier relationship, and how they affect the supplier's service performance. This allows for a more nuanced understanding of relationships within triads.

3. Methodology

To address the objectives of this study, an abductive case research approach was adopted. Case studies are appropriate when the environment under study is complex, such as when the boundaries between the phenomenon of interest and the context are unclear (Hartley, 2004). By documenting practices and behaviours, and the meanings that participants ascribe to them (Voss et al., 2002), case studies can also help the researcher to provide an in-depth understanding of the nature and inherent complexity of the phenomenon. The rationale for adopting an abductive approach is that it allows the researcher to cycle between theory and empirical data through "systematic combining" (*cf.* Dubois and Gadde, 2002). In that way, the research was neither constrained by theory, nor overwhelmed by data without an initial lens through which to view the data. Abduction allows one to anchor his or her findings to an initial theory that is then developed —and possibly extended— through each round of data collection and analysis (Kovacs and Spens, 2005). Theory development and data collection and analysis are therefore symbiotically linked.

As part of this work, an embedded, comparative case study research design was adopted (Yin, 2009). A "case" in this research refers to an inter-firm working relationship between the manufacturer —operating in the UK commercial vehicles industry— and one of its specialist service suppliers (partner). These partners are responsible for the delivery of services to the manufacturer's customers, forming multiple triads. The analysis and findings are based on three such embedded cases. Before explicating the case selection procedure, the research setting is briefly described.

3.1 Empirical Setting

Fortigo (a pseudonym) is the UK subsidiary of a large German commercial vehicle manufacturer. Fortigo provides "solutions" to customers and is considered by industry experts to be class-leading. Fortigo aspires to "sell per kilometre" instead of selling a commercial vehicle. Instead of buying a vehicle, the customer pays a weekly fee week based on the services included in the contract. For contracted vehicles, services can be "regular" (e.g., preventive inspection and maintenance, British Ministry of Transport (MOT) test of roadworthiness) or "emergency" (e.g., breakdown attendance), and are provided by a network of service sites. Thirty percent of them are wholly owned, with the rest being independent suppliers operating as franchisees. Employees at the service sites need to be technically adept to repair vehicles and competent in using the multiple online Fortigo systems and platforms for locating, recording, and transmitting information regarding the contracted vehicles. At the time of this study, approximately 60% of Fortigo's yearly revenues came from customized fixed-cost service contracts, typically with large business customers. The remaining 40% came from the sale of stand-alone vehicles to smaller businesses and owner-drivers, and their ad hoc after-sale support.

In 2005, after discussions with major customers, Fortigo introduced new clauses in the franchise agreement (e.g., cleanliness, image) to influence customer satisfaction. Service performance aspects were translated into Key Performance Indicators (KPIs) tied to a quarterly financial bonus scheme. KPIs include, among others: breakdown response times, parts availability, and vehicle first time pass rate for the MOT roadworthiness test. These KPIs indicate how good each service site is at maximizing vehicle availability (e.g., vehicle "uptime"), while bonus money is proportional to the number of achieved KPIs and the number of hours spent servicing vehicles under contract or warranty. Consequently, the manufacturer has been

consistently measuring the service performance of its network members towards its customers, and rewarding service sites accordingly. Moreover, Fortigo's customers considered vehicle uptime a proxy for their satisfaction. During the explorative phase of the study this was corroborated by top managers of Fortigo and by two major hauliers.

Interaction and communication between Fortigo and the independent sites is done via e-mail, telephone, and face-to-face meetings, and spans several levels and departments. Fortigo maintains contact with its customers at the strategic and operational levels. The sites are also in direct interaction with the customers of Fortigo for planned (e.g., before and during the mandatory six-week vehicle inspection) or unplanned (e.g., part replacement) service delivery. Hauliers and logistics providers have large fleets, meaning that direct supplier–customer interaction is frequent. Therefore, the actors in this study exhibit distinctive structural features of service triads, where service suppliers have to be in direct contact with the customer (Wynstra et al., 2015). In sum, the research setting comprises service triads and provides an appropriate environment for objectively sampling service sites, and comparing and contrasting the relationships based on the service performance scores of those individual sites.

3.2 Case selection

We sampled three service sites based on their performance between 2009 and 2011, across the five major KPIs set and measured by Fortigo. A stratified, purposeful sampling strategy (Patton, 2002) was adopted, selecting one site from each performance stratum (high, average, low) based on an average score across KPIs and over time. Thus in the analysis, the role of each relationship connector in the service performance of the site derived its significance from having emerged out of heterogeneity. It also allowed the examination of the similarities and major variations between cases (Patton 2002). The sites and their performance scores are detailed in Table 2.

----------Insert Table 2 approximately here----------

3.3 Data Collection

Data were collected from 24 respondents from the focal firm (Fortigo) and the three service sites (Chi, Psi, Zeta). A protocol was developed to guide the research, which, in line with the abductive tradition, evolved over the course of data collection. The first protocol was focused upon the evolution of the network, the interaction between Fortigo and the sites, and the

incentives scheme. As more data were collected, the relationship connectors were operationalized to the case context. Interviews were conducted with individuals who were identified as being the most knowledgeable about the relationship. Secondary data were collected during the research (e.g., documentation, organograms) to aid triangulation (Jick, 1979). Table 3 lists the interviewees.

----------Insert Table 3 approximately here----------

3.4 Data Analysis

Interviews were recorded, transcribed verbatim, and input into qualitative data analysis software (NVivo 9.0). Due to data collection taking place sequentially, and in line with abduction, each case was coded separately using template analysis (King 2004). The five relationship connectors comprised the *a priori* level-one categories in the hierarchy, and the context-specific facets and manifestations operationalizing the connectors constituted the provisional sub-categories. These are listed in Table 4.

----------Insert Table 4 approximately here----------

All data were scrutinized at least three times before the case-specific templates were considered "final" (King 2004). After each interview was analysed, the protocol was revisited and altered if the findings suggested a revision. Extensive case reports were duly produced, structured around the five relationship connectors. All three authors independently reviewed the reports, and agreed that contingent variables, exogenous to the relationship that were present in transcripts from the early rounds of interviewing, had a role to play in service performance. The protocol was subsequently adjusted and the contingent factors were made part of the analytic 'story'. Their inclusion was necessary in order to describe and understand the effect of relationship connectors on performance in this study. The two factors were:

1. Service site size (measured by the number of individuals employed). Firm size often reflects unobserved features such as "scale and scope economies, market power aspirations, and the ability to aggregate inputs" (Anderson and Schmittlein 1984, p. 388). In this context, there was a stark contrast between the operation of the smaller

Zeta and the larger Chi and Psi, which were part of large, national chains with well-defined organization structures, reporting to a board of directors and private investors.

2. Proportion of the site's revenues coming from Fortigo fixed-cost contracts and warranty activity (from now on "product–service penetration" or PS penetration). This is closely related to the concept of service penetration which positively influences the effective and efficient delivery of product–service offerings (Fischer et al., 2010). PS penetration is largely outside of the service site's control, and depends on the customer-base in the site's geographical area (e.g. large fleet customers are more likely to have their vehicles under Fortigo service contracts) and how effective has the Fortigo salesforce been in the area. As such, it can vary considerably between service sites: for some, it comprises a major part of their work (see Table 2). The remaining work comes from ad hoc servicing and from non-Fortigo vehicles. Thus, in this study, PS penetration is a measure of how dependent a site is on Fortigo's product–service offerings for revenues. This is in line with a long research tradition that measures dependence as the percentage of a company's business that comes from contracts with another company, and the size of the contribution that this makes to the former's profits (e.g. El-Ansary and Stern, 1972). Simultaneously, PS penetration indicates how accustomed the employees of a site are to dealing with vehicles under service contracts. These contracts, which are between the customer and Fortigo, include service features that require the use of the Fortigo inter-organizational IT platforms.

As part of the cross-case analysis, the lead author conducted a second cycle of coding, which involved the original data corpus, the case reports, and personal notes that recorded the impressions and ideas of the other two authors. This discerned the role of each relationship connector and contingent factor in the performance of the site, and uncovered the interplay between them. To this end, *pattern coding* (Miles and Huberman 1994) was applied, whereby each code reflected a causal relation between elements. These relations were phrased in the form of propositions and were compiled into an analytical model that addresses the study's objective. The model provides a nuanced account of the influence of the manufacturer–supplier relationship on the service performance of the supplier, by capturing the individual role of each relationship connector, exogenous variables, and the interplay between them.

4. Findings

4.1 Within- and cross-case analysis

The results of the within-case analysis are presented in a connector-by-connector manner in Table 5.

----------Insert Table 5 approximately here----------

Table 6 presents the cross-case comparison (second column), and the *relative* magnitude of each connector (Miles and Huberman, 1994). This categorisation is routinely undertaken in similar comparative case study research (e.g., Pagell and Wu, 2009). Thus, the three cases are ranked based on their manifest levels of the five relationship connectors. The results indicate that although the connectors are not perfectly correlated, if one ranked the three relationships on a transactional–relational relationship continuum (*cf.* Mena et al., 2013), the Chi case is the most relational, then Psi, with Zeta being the least relational. In addition, Table 6 includes information on the sites' average service performance. Chi has been performing exceptionally with Fortigo's customers, Psi is average, and Zeta is below average. Therefore, the more relational the relationship between the manufacturer and the service site, the higher the service performance of the site towards the manufacturer's customers. Beyond establishing the interdependence between the nature of the manufacturer-supplier relationship and service performance, the purpose of this study is to submit a nuanced account of *how* this relationship affects service performance. This is discussed next.

----------Insert Table 6 approximately here----------

4.2 The Influence of the Manufacturer–Supplier Relationship on the Supplier's Service Performance

Figure 1 shows the interplay between the relationship dimensions, contingent factors, and supplier service performance. Each link in the model is numbered and was considered salient only if at least two of the three cases provided supporting evidence without the third case

disconfirming it. This section describes the role of each element with reference to the linkages it has.

----------Insert Figure 1 approximately here ----------

*The role of product–service penetration***.** Chi's high level of PS penetration means that they have accumulated significant experience in servicing vehicles under contract. This requires familiarity with and competence in using the web-based systems for recording the activities and electronic transmission of information. Network-facing Fortigo managers suggested that within the network of service sites, Chi are amongst the most compliant to the implicitly imposed roles and routines for the efficient utilization of the systems (i.e., the first facet of operational linkages). With joint activities (i.e., the second facet of the construct), as the large customer fleets in the area are on fixed-cost contracts, staff from Chi are often involved in review meetings with Fortigo sales and after-sales key account managers, and customer representatives. Similarly, joint local customer visits with the co-located Fortigo salesmen are frequent. Thus, in the Chi–Fortigo case, high PS penetration implies high levels of operational linkages. Contrarily, Zeta and Psi are located in rural areas with predominantly small business customers or owner-drivers, meaning fewer vehicles on service contracts and less frequent interaction with national fleets compared to Chi (i.e. low PS penetration). For this reason they have fewer joint activities with Fortigo. In addition, and especially with Zeta, employees often encounter issues realated to vehicles under contract with which they have little experience, and consequently have to use unfamiliar functions of the web-based systems. This limited exposure to solutions decreases their adherence to the roles and routines required for the use of the web-based systems. Overall, the Chi and Zeta cases suggest that PS penetration and operational linkages are positively associated (high-high vs. low-low). The Psi case differs slightly (low PS penetration and moderate-to-high operational linkages – see Table 6) but the analysis suggests that this is due to the influence of size (P_3 below). Accordingly, it is proposed that:

P_1: The higher the service site's PS penetration, the higher the operational integration between the site and the manufacturer.

Although contracts are homogenous, and the prescribed rules and obligations apply equally to all service sites, the manner in which employees perceive these rules and obligations varies from site to site. Chi's extensive experience with Fortigo's fixed-cost contract customers has led to a clear understanding of the explicit rules and procedures, and of the jobs that can be claimed for and reimbursed. This was confirmed by the site's consistently excellent performance in audits conducted by Fortigo. Since more than 50% of its overall revenue comes from service contracts and warranty activity, Chi employees have no choice but to adhere closely to the prescribed rules and routines. This obligation is taken for granted, and is deeply embedded in the site's working culture. Thus, Chi do not perceive their site's relationship with Fortigo to be overly formalized. Conversely, due to the low product–service penetration (around 20% in both instances), Psi and Zeta are less familiar with the rules and procedures, and are consequently less clear about them. This was also demonstrated through recent fines imposed on both sites for non-compliance which left employees disgruntled. The interviewees questioned whether a small PS penetration should be associated with so much rigidity and intolerance to deviations (i.e., over-formalization). This is because low PS penetration means that few labour hours are "sold" to Fortigo for servicing vehicles under contract. Since the monetary bonus tied to the incentives scheme is proportional to the number of hours sold, the maximum amount of money that sites with low PS penetration can earn through the scheme is small. Thus, a small potential monetary reward does not justify strict adherence to the contractually prescribed rules. It is too much effort for too little benefit, prompting Zeta and Psi to ask for "more discretion" and "less red tape." Further, Fortigo's intolerance to deviations exacerbates the perception of over-formalization. On the basis of the above, it is proposed that:

P_2: The lower the service site's PS penetration, the higher the level of perceived over-formalization of its relationship with the manufacturer.

The role of site size. Chi and Psi have enough back-office personnel to create an efficient work organization that includes task specialization. Consequently, they have developed expertise in handling the web-based systems; routines are followed closely and contract and warranty related jobs are completed efficiently. Conversely, being a small, family-run business, Zeta cannot afford task specialization due to resource constraints. The three people in the back-office are responsible for a wide range of tasks, including helping on the shop floor. None of them is a

dedicated administrator, and the contracts and warranty manager is required on the shop floor on busy days, or when a mechanic is on leave. Thus, employees are not able to develop the necessary competence to adhere to the implicit roles and routines that come with the interlinking systems. Additionally, their small size appears to be one of the reasons behind the nonexistence of joint activities between Zeta and Fortigo. Unlike the larger Chi and Psi, Zeta's scale of operation does not justify a visit from the parts representative for joint customer visits and spare parts promotion campaigns, while the new-vehicle sales representative spends his time elsewhere. In effect, the smaller the site, the less likely there will be high operational integration. Thus, it is proposed that:

P_3: The larger the service site, the higher the operational integration of its relationship with the manufacturer.

In this context, site size also affects cooperativeness. Zeta feel that they are discriminated against because they are small. They claim that they "know for a fact" that other sites get paid for jobs for which Zeta are not paid, and are remunerated for which Zeta are required to provide further evidence. Furthermore, because of its size, Zeta does not qualify for direct Fortigo parts delivery. They buy parts from another network member that makes profit on the sales, which is perceived as unfair. Zeta believe that Fortigo does not care about them and that the uncooperative attitudes by the Fortigo sales representative and parts department are due to Zeta's small size. Additionally, Zeta often feel "messed about" because the nearest site, the larger and more professional Chi, "steals" their work, and Fortigo allows this to happen. On the Fortigo side, both the CEO and after-sales director stated that they would prefer to have 10-12 professional service partners with multiple sites. It may be that Fortigo does not consider small family-owned sites like Zeta part of their future plans, and consequently do not show cooperation at all levels of the relationship. As a result, the Zeta principal is trying to use the Fortigo franchise credential for his business's benefit and sell the image of an independent garage, without a long-term future tied to Fortigo's. In conclusion, it is proposed that:

P_4: The larger the service site, the more cooperative its relationship with the manufacturer.

The role of information exchange. Frequent interpersonal communication and the effective and efficient exchange and use of information facilitates Chi in performing tasks quickly and correctly. Vehicles are turned round faster, having been serviced properly. Occasionally there are long response times (e.g., from the parts department) and the absence of an out-of-hours communication link hinders job completion and increases vehicle turnaround times. Similarly, Psi and Zeta stressed that low information availability leads to longer turnaround times, as the vehicles remain stranded while waiting for Fortigo to respond to a query. Furthermore, poor communication between the Fortigo used-vehicles sales force and Zeta and Psi often results in vehicles arriving for their six-week inspection or maintenance unexpectedly. This never happened to Chi, due to regular information sharing. Moreover, the inefficiency of Zeta in using the web-based systems means that it often takes them longer to complete the diagnosis of non-standard defects, and they need to contact Fortigo for assistance. Requesting assistance is an unnecessary communication link and Fortigo's response may not be timely leading to delays that affect service performance. Thus, it is proposed that:

P_5: The higher the information exchange between manufacturer and service site, the higher the site's service performance.

The role of operational linkages. For information to flow between the site and Fortigo, adherence to the roles and routines implicitly defined by the web-based systems is necessary. The site employees have to record and transmit information (e.g., when diagnosing a vehicle) to Fortigo. This information has to be standardized, accurate and complete, which may not occur if the assigned person is unfamiliar with the systems. Zeta is unfamiliar with the routines and procedures, leading to frequent delays. Psi and Chi are more competent than Zeta with the web-based systems. Also, Fortigo stated that seven out of ten phone calls from the sites (delaying vehicle turnaround) are about information readily available on the websites, meaning that routines for efficient information gathering have not been followed. Sites may also have no computer station on the shop floor for night shift employees to use. Access and transmission of information is thus delayed, meaning that jobs have to wait. In short, inefficient usage of the interlinking systems impairs information exchange.

With joint, routinized activities (the second facet of operational linkages), Psi, and especially Chi, have regular meetings and customer visits with Fortigo, where relevant information is regularly shared. The absence of such activities with Zeta negates information exchange. Accordingly, it can be proposed that:

P_6: The higher the operational integration between manufacturer and service site, the higher the levels of information exchange.

The role of cooperative norms. For Chi, the expectation of a long-term future increases the tendency of individuals from both parties to create interpersonal relationships. Furthermore, cooperation and the perception of common goals facilitate communication links, encouraging open information sharing (e.g., between the site and the salesmen). Interpersonal relationships were also observed in the other two case relationships (e.g., Psi principal and Fortigo regional engineer). However, information exchange was lower, because the two sites have issues with certain departments in Fortigo such as spare parts and contracts (Psi) or the overall organization (Zeta). Due to the perceived decrease in cooperativeness between Psi and Fortigo, communication diminished (leading to a drop in service performance). Fortigo's regional engineer stated that staff from Fortigo and Psi "do not bother" to communicate. Thus, it can be proposed that:

P_7: The more cooperative the manufacturer–service site relationship, the higher the levels of information exchange.

The perception of interdependence between Chi and Fortigo facilitates issue resolution in an informal manner. This happens due to interpersonal relationships such as the one between the Chi general manager and the Fortigo repair and maintenance manager. They have known each other for many years, and trust that every decision taken by both parties is for mutual benefit. The general manager admitted that this helps in resolving issues informally. Moreover, the expectation of a prolonged, cooperative Fortigo–Chi relationship, shared amongst Chi employees, decreases the perceived level of formalization. Conversely, the "discriminative"

behaviours felt by Psi and Zeta affect their perception of Fortigo's tolerance to deviations from the prescribed rules. Thus, informal arrangements are more difficult to develop. Therefore:

P_8: The more cooperative the manufacturer–service site relationship, the lower its formalization.

The role of relationship-specific adaptations. Relationship-specific adaptations are necessary in this context. In all three cases some of the adaptations have lost their specificity, for example, investment in facilities and machinery. Also, the investment in Fortigo-organized technical and administrative training in servicing Fortigo vehicles and using the online platforms brings benefits outside of the relationship, as the site acquires expertise that can be "sold." However, all such investments were performed for Fortigo and, as such, are relationship-specific. There is a causal link between adaptations and service performance. Zeta believes that although training is expensive, it would be difficult to achieve better service levels without investing in it. Much of the performance improvement of Psi is attributed to the extensive relationship-specific adaptations that took place when the current principal took over. The investment in technology and training has enabled the employees to service vehicles efficiently and effectively. Chi have extended their opening hours for Fortigo customers, and can admit vehicles at almost any time during the week to maximise vehicle uptime. Whilst the levels of adaptations are similar across the three cases, performance differs significantly. From this it can be inferred that relationship-specific adaptations are an insufficient condition for high performance, and performance differences are to be explained by differences in the levels of the other constructs. Nevertheless, it can be proposed that:

P_9: The higher the relationship-specific adaptations by the service site, the higher its service performance.

Relationship specific-adaptations (e.g., recruitment, IT infrastructure, training) also increase the level of operational linkages. Chi and Psi recruited additional people and assigned them specific roles and tasks for the efficient utilization of the web-based systems. Investment in Fortigo-organized training is also beneficial, especially for Psi. Psi's PS penetration would imply decreased operational integration (see P_1). However, extensive training on the web-based

systems compensates for this disadvantage. Technical training in service and repair processes also contributes to the efficient usage of the systems (i.e., operational linkages) as the technicians become more accustomed to capturing and recording information. Thus:

P_{10}: The higher the relationship-specific adaptations by the service site the higher the operational integration between the site and the manufacturer.

The role of legal bonds. The third and last direct influence on service performance is legal bonds. The performance of Psi and Zeta are impeded because their working relationship with Fortigo is overly formalized. A number of respondents believe that Fortigo's "obsession" with rules and its intolerance to deviations from prescribed processes obstructs them from focusing on servicing vehicles, resulting in longer vehicle turnaround times. Conversely, there were no complaints about the degree of formalization in the Chi case. This is predominantly because issues can be resolved in an informal manner. Informality is absent in the other two cases. Informal issue resolution helps bypass the barriers often raised by rigid, prescribed rules, and is absent in the Psi and Zeta cases. Therefore, it is proposed that:

P_{11}: Over-formalization of the manufacturer–service site relationship reduces supplier service performance.

5. Discussion and conclusions

5.1 Theoretical contributions

Through the use of an abductive approach this work extends Cannon and Perreault's (1999) theorizing on relationship connectors to uncover the interplay between the connectors, two contingent factors (size and product-service penetration), and service performance in service triads. By adopting an abductive approach, the research extends and contextualises the original work of Cannon and Perreault (1999).

This research makes three contributions. The *first contribution* shows that the manufacturer–supplier relationship in this service triad plays a significant role in the provision of the offering as it facilitates or hinders service performance. This corroborates the idea that the nature of the relationship and the performance of the parties in a triad are interdependent (e.g.,

Wu and Choi, 2005), and relational relationships (i.e., high information exchange, operational integration, cooperativeness, relationship-specific adaptations, and low formalization) have positive consequences for the triad as a whole (Peng et al., 2010; van der Valk and van Iwaarden, 2011; Bastl et al., 2012; Wacker et al., 2016). Thus, when a manufacturer uses a supplier to deliver services for product-service offerings—whether to access unique external capabilities or for cost-based outsourcing—the relationship between the manufacturer and supplier needs to be relational rather than transactional.

The *second contribution* demonstrates that in addition to a relational relationship, for a supplier to achieve high service performance towards the manufacturer's customer, significant exposure to the product–service offering being provided (i.e., service penetration), and access to resources and task specialization of staff (afforded through site size) are prerequisites. These findings indicate that while the relationship connectors are important, contingent factors play a role in ensuring that the supplier's performance to the customer is high. For example, without exposure to and experience with the product–service offerings, suppliers would be unfamiliar with the changes to the different ways of working. Product–service offerings are more complex and sophisticated than stand-alone products. This complexity requires the flexibility afforded through more relational relationships, but also the benefits of task specialization and resource abundance.

The *third and final contribution* is to treat the relationships within the service triad as multidimensional rather than cooperative or competitive (a binary distinction prevalent in the literature, e.g., Wu and Choi, 2005). Thus, a nuanced account of *how* the manufacturer–supplier relationship affects the service performance of the supplier towards the manufacturer's customers is provided. The research also uncovered the impact of two contingent factors: service site size and product–service penetration, and how they affected the performance of the supplier towards the manufacturer's customer. The interplay between these was captured in an analytic model and a series of propositions discussed below.

In this research, product–service penetration, site size, and relationship-specific adaptations emerged as the pre-cursors of relational relationships, and in extension, high service performance. If a site has greater experience with these contracts they will be more familiar with the documentation and web-based systems used, creating greater operational linkages. Therefore, greater exposure to more advanced offerings leads to an increase in the operational linkages

between the site and the manufacturer. In turn, site size should facilitate greater task specialization. This could include staff dedicated to managing interlinking systems and staff explicitly managing the Fortigo–site relationship. Size also means that greater turnover at a site —implying greater access to specialist resources (tooling, systems, databases, etc.)— positively affects operational linkages. Relationship adaptations refer to investments to products, processes, and procedures specific to the relationship (*cf.* Cannon and Perreault, 1999). In this study, all suppliers made significant investments in technology and training in order to provide better service to Fortigo's customers, suggesting that relationship-specific adaptations are necessary in this context. Overall, extensive exposure to product–service offerings, greater resources, and relationship adaptations would have created and enhanced relationship-specific systems, procedures and routines, that is, operational linkages.

Cooperation is higher when the site is larger. This could be for the following reasons: First, as a site increases in size, task specialization and access to resources will increase (Anderson and Schmittlein, 1984). By creating specialization, larger sites may have specific individuals to manage the cooperative relationship. Alternatively, Fortigo may be "picking winners" and have more cooperative relationships with those sites that have more customers. Operational linkages and cooperation enhance information sharing. This is because the two act as a channel (operational linkages) and an orientation (cooperation) for greater information exchange.

Increased cooperation reduced the reliance of the service site on legal bonds between it and the manufacturer. This is in line with much of the extant research that suggests that cooperative norms reduce the level of formalization of the relationship (e.g., Poppo and Zenger, 2002). Reduced formalization is also a result of increased PS penetration. This may be due to the recognition that services are heterogeneous and require greater flexibility in their delivery (Sampson and Froehle, 2006). Finally, service performance is directly enhanced by increased relationship adaptations, information sharing and reduced reliance upon legal bonds, as the rigidity of contracts would negatively affect service performance. The importance of these connectors indicates that parties that provide and support product–service offerings should be committed to investing time and resources to the relationship, as well as the sharing of pertinent information. By reducing reliance on contracts, both parties will also be more flexible in jointly working together to maximise the performance towards the customer.

This research supports the assertion that the connectors may not necessarily be correlated with each other to reflect a one-dimensional construct of "relationalism" (Vesalainen and Kohtamaki, 2015). Relationships are normally multilevel, complex phenomena (Ritter et al., 2004), and incidents or exogenous variables that alter the state of one connector may or may not have systemic effects that affect the other connectors and eventually performance. This research shines some light onto the complexity of the phenomenon and how the interplay of relationship dimensions and contingent variables affect service performance.

5.2 Limitations and extensions to the work

As this work was conducted within one network, the results may be unrepresentative of promising practices. The first logical extension is to see if the analytic model holds for other firms and sectors in order to enhance its generalizability. A survey would also represent a fruitful avenue for further research in order to formally test hypotheses derived from the propositions developed in this work. Further qualitative enquiry regarding the role of size and PS penetration could be conducted to understand whether there are additional contingent antecedents. Lastly, this study focused on a one-way causal path. It investigated which relationship dimensions affect service performance. The premise of reverse causality, i.e. whether service performance was the driver (as well as the outcome) of relational relationships (*cf.* Autry and Golicic, 2010), or whether there exist feedback loops between the different elements of the model (e.g. whether increased operational integration is conducive of higher PS penetration), was beyond the scope of the work. Thus, this could be a worthy further research endeavor.

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Table 1
The Cannon and Perreault (1999) Framework of Relationship Connectors

Relationship connector	Description	Role
Information exchange	An expectation of an open sharing of information useful for both parties.	Improves overall and service performance (e.g., Johnson and Mena, 2008; Bastl et al., 2012). Related concepts, such as communication, are central for channel performance and development of trust.
Operational linkages	The degree to which the systems, procedures and routines of both parties have been linked to facilitate operations.	Important when providing solutions (Bastl et al., 2012). Joint activities and processes facilitate the flow of products, services, and information, and reduce transaction costs. Such processes, as part of *supply chain integration*, positively affect performance (e.g., Frohlich and Westbrook, 2001).
Legal bonds	Detailed and binding contractual agreements that specify the obligations and roles of both parties in the relationship.	Provides safeguards and regulates exchange. Increases supplier performance (e.g., Mayer and Argyres, 2004) but can become a liability. Informal control may act as a safeguard against inherent transaction risks (e.g., Dyer and Singh, 1998), and is desirable in B2B service contexts (e.g., van der Valk and van Iwaarden 2011).
Cooperative norms	Reflect expectations the two parties have about working together to achieve mutual and individual goals.	Norms such as solidarity and flexibility, and the related concept of trust, facilitate innovation, value creation, learning and performance (e.g. McEvily et al., 2003). Trust also moderates the relationship between several other concepts (see Vesalainen and Kohtamaki, 2015).
Buyer and supplier adaptations	Investments in adaptations to process, product, or procedures specific to the needs or capabilities of an exchange partner.	Directly enhance exchange performance. Important in servitized contexts (e.g., Lockett et al., 2011).

Table 2
The Three Sampled Service Sites

Name	Location	Performance (since 2009)*	Dual franchise**	Number of employees	Product–Service Penetration
Chi	Southwest of England	4.19 / 5	NO	52	>50%
Psi	East of England	3.67 / 5	YES	34	~20%
Zeta	South of England	3 / 5	NO	11	~20%

* The average performance score for all sites since 2009 was 3.67.
** Whether or not the site has a franchise agreement with additional commercial vehicles manufacturers.

Table 3
List of Participants

Participants' job positions	Organization
CEO	Fortigo
UK after sales director	
Head of UK network development	
Head of UK service and support	
Head of after sales business development	
Retail sales director	
National key account manager	
Repair and maintenance manager	
Regional manager, customer and technical support South	
Regional manager, customer and technical support East	
After sales key account manager	
Service advisor	Chi
General manager*	
Parts manager	
Service, marketing and business development manager*	
Service operations manager	
Dealer principal	Psi
Service site controller	
Parts manager	
After-market manager	
Dealer principal	Zeta
Parts manager	
Service manager	
Warranty and contracts manager	
*Indicates two interviews with this subject	
Total number of interviews: 26	

Table 4
Operationalization of the Five Relationship Connectors

Connector	Facets / manifestations
Information exchange	- Intensity, frequency, quality, openness of communication with counterparts face-to-face or over the phone - Level and quality of information exchanged through the web-based systems and portals
Operational linkages	- Evidence of joint routines and activities between individuals from Fortigo and the service site - For the service site employees: competence in and familiarity with the use of the web-based interlinking systems
Legal bonds	- Explicitness and rigidity of the relationship - Fortigo's tolerance to deviations from what is prescribed in the contract - Evidence of any informal arrangements and possibility of bypassing the explicit rules
Cooperative norms	Whether there is: - concern about mutual success - recognition that problems are joint responsibilities and cooperation is necessary - willingness to make cooperative changes - a perception that Fortigo takes advantage of its bargaining position - a "partnership mentality" as opposed to pure commercial relationship
Relationship – specific adaptations by service supplier	- One-off (e.g., special machinery, facilities) and ongoing (e.g., personnel training) relationship-specific investments - Adaptations in the operation of the site specifically for Fortigo and its customers (e.g. extended operating hours)

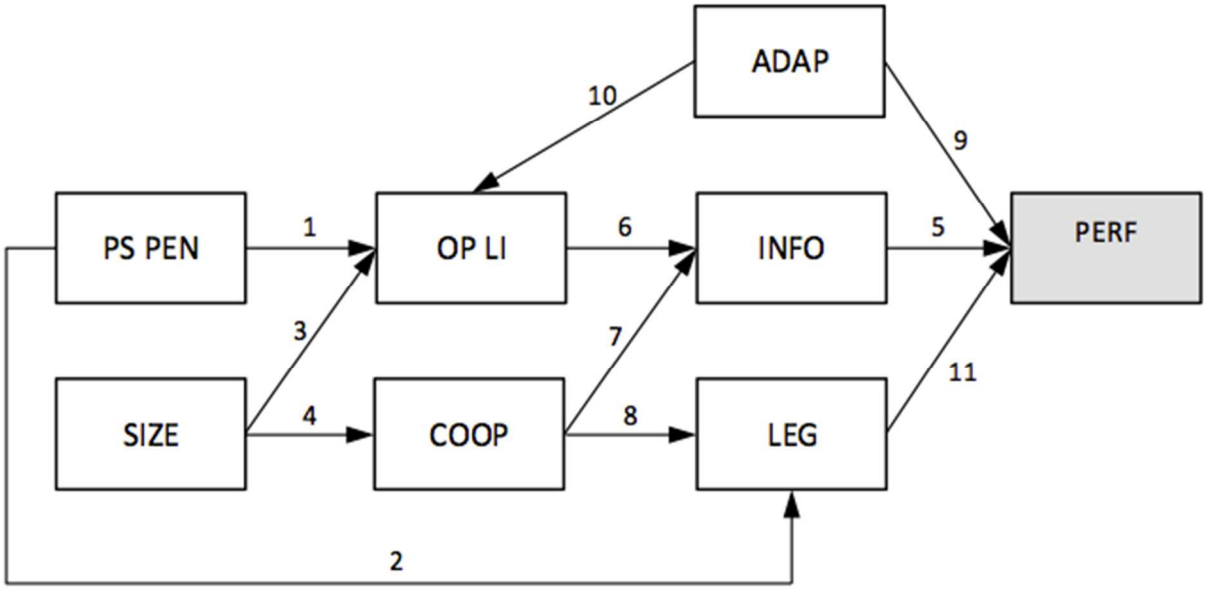
Table 5
Synthesis of Within-Case Findings

Case	Fortigo–Chi relationship	Fortigo–Psi relationship	Fortigo–Zeta relationship
Information exchange	- Frequent, open interpersonal communication. - Chi considered to be one of the best at transmitting and receiving electronic information. - Chi concerned at instances with timeliness and response times from certain Fortigo departments.	- Psi happy with web-based information exchange but not with senior Fortigo managers and the sales department. Considered (by Fortigo) to be efficient at electronic information exchange. - Psi and Fortigo HQs both reluctant at times to engage in exchange of information so issues tend to "fester."	- Zeta finds it difficult to locate information and perceive that Fortigo could be better at sharing information. - Very low information exchange with key counterparts. - Perception they are "forgotten about." - Evidence that they are not as good as other sites in providing complete and adequate information.
Operational linkages	- Familiarity with the web-based systems and adherence to the implicit roles and routines due to increased service penetration, efficient internal task allocation and training. - Joint activities with the salesmen, parts representative and regional manager.	- Familiarity with the web-based systems and adherence to the implicit roles and routines due to investment in training and recruitment of extra personnel. - Recent collaboration for expansion of parts business, joint customer visits for problem solving with Fortigo regional engineer. No activities with the co-located Fortigo salesman.	- Not familiar with the web-based systems. Lack of task specialization and experience due to small number of trucks under Fortigo contracts. - Absence of joint activities with Fortigo employees.
Legal bonds	- Clear understanding and application of standards and rules. - Long-term personal relationships allow informal issue resolution, and decrease reliance upon explicit rules.	- Relationship perceived as overreliant on explicit rules and procedures. - Perceived inflexibility and intolerance to deviations from the prescribed behaviours, reflected through the reactions to recent fines imposed upon Psi by Fortigo. - Informal part of the relationship is underdeveloped.	- Strong perception that the relationship is overreliant on explicit procedures. - Disappointed that Fortigo are so intolerant to deviations from the prescribed procedures. - Informal part of the relationship is not as developed.
Cooperative norms	- Future success requires joint effort to achieve individual or common goals. - Reciprocity, apt norms and willingness to proceed with cooperative changes. - Cooperative spirit permeating all organizational levels and aspects of exchange.	- Psi devoted to a common future with Fortigo. Belief that they do their best to prove it but feel let down by Fortigo. Fortigo operate based on a mistaken perception of Psi. - Cooperation and common goals with regional engineer and the after-sales organization, but overall, team spirit is not always felt.	- Zeta acknowledges that Fortigo are normally cooperative and helpful, though exceptions exist. - When referring to Fortigo as a whole, Zeta feels discriminated against and "messed about". - Zeta considering a common future but more concerned about individual goals than common ones.
Relationship adaptations	- Commitment to extended opening hours and training. - Investment in infrastructure and in dedicated parts representative.	- Significant investment in infrastructure and staff to change the poor reputation. - Extensive training even though some is thought to be unnecessary.	- Significant early investment in infrastructure to continue being a franchisee. - Extended opening hours. - Extensive training even though at times looks unnecessary.

Table 6
Synthesis of Cross-Case Findings

Dimension	Cross-case comparison	Relative ranking of cases in terms of the connectors		
		Chi–Fortigo	Psi–Fortigo	Zeta–Fortigo
		Performance: high	Performance: average	Performance: low
Information exchange	Information exchange (both, interpersonal and electronic) is perceived to be high in the Chi case, moderate in the Psi case (interpersonal communication between certain individuals is problematic) and low in the Zeta case (both through interpersonal communication and the web-based systems).	*High*	*Moderate*	*Low*
Operational linkages	Chi and Psi show a similar level of operational integration (apart from the absence of joint activities with the salesman for Psi). Zeta has no joint activities with Fortigo and are not sufficiently familiar with the web-based systems. This reflects a low level of adherence to the set roles and routines, which in turn impairs the IT-enabled transmission and receipt of information with Fortigo.	*High*	*Moderate /High*	*Low*
Legal bonds	Only Chi is comfortable with the degree of relationship formalization. The other two consider their relationships to be overly reliant on the prescribed rules, while the informal component seems underdeveloped. The perceived intolerance of Fortigo to deviations from the explicit rules is detrimental. However, they both acknowledge the necessity of some set rules.	*Moderate*	*High*	*High*
Cooperative norms	Only Chi has a cooperative relationship where norms such as mutuality, durability and flexibility permeate the exchange. The other two sites feel let down, undervalued, or exploited. However, it is recognized that many of the key contacts are cooperative and care for the good of the sites.	*High*	*Moderate*	*Low /Moderate*
Relationship specific adaptations	All sites have extensive relationship specific adaptations. Even though to achieve the franchise status investment is mandatory, relationship adaptations are ongoing, and on the whole seem to be necessary in this context.	*High*	*High*	*High*

FIGURE 1
Analytic Model of Service Performance and its Determinants



PERF – Service delivery performance
INFO – Information exchange
OP LI – Operational linkages
LEG – Legal bonds
COOP – Cooperative norms
ADAP – Relationship adaptations
SIZE – Site size
PS PEN – Product-service penetration

Manufacturer–Supplier relationships and service performance in service triads

Manuscript revision

Manuscript ID: **IJOPM-11-2015-0719-R3**

Dear Editor-in-Chief, Associate Editor and Reviewers

We are submitting for your consideration the revised version of our manuscript. We believe we have now addressed all comments. Our responses and rationale are provided in the continuation of this document.

With Kindest Regards,

Authors

AE:

AE-1: Also, since it has been some time since you first submitted your paper, we would encourage you to perform a final literature update and include any relevant new citations. You may want to include IJOPM references in this but this is for you to decide.

Response: We updated the literature review with two relevant references, both from IJOPM. The two additional references are:

Benedettini, O., Neely, A. and Swink, M. (2015), "Why do servitized firms fail? A risk-based explanation", *International Journal of Operations & Production Management*, Vol. 35 No. 6, pp. 946–979.

Wacker, J.G., Yang, C. and Sheu, C. (2016), "A transaction cost economics model for estimating performance effectiveness of relational and contractual governance", *International Journal of Operations & Production Management*, Vol. 36 No. 11, pp. 1551–1575.

We also added the following reference in order to support our argument in response to R3 (see below)

El-Ansary, A.I. and Stern, L.W. (1972, "Power measurement in the distribution channel", *Journal of Marketing research*, Vol. 9 No. 1, pp.47-52.

Lastly, we removed several less critical references as part of reducing word count of this manuscript.

Reviewer 3

R3-1: After looking at the paper and the previous reviews, I believe the author(s) have addressed all of the points of both reviewers, especially after three revisions. The first reviewer notes: "I continue to disagree with the way you position the concept in your research and propositions. PS penetration may be an exogenous variable, or not, and 5% may or may not be better than 50%. That does not better. It is THE PROPORTION OF REVENUES COMING FROM FIXED-COST SERVICE CONTRACT ACTIVITY."

This reviewer rejects the paper based on this condition. He or she may disagree with the author, but there is no evidence provided as to what a better measure should be.

Based on this, I feel the authors need to acknowledge the limitation made by this reviewer in their paper, and explain why they decided to proceed with the PS measure, and explain it further. However, another revision review is not needed if they can accomplish this before the paper is accepted.

Response: In response to R3's comment as to why we proceeded with the PS penetration measure, the answer is simple. As we mention in section 3.4, the importance of PS penetration (which is the proportion of the site's revenues that comes from Alpha contracts) and site size, emerged from early on in the interviews. Including these two factors in the analytic story was necessary for us to adequately describe and understand the phenomenon under study. The related text of 3.4 (p.9) is:

"All three authors independently reviewed the reports, and agreed that contingent variables, exogenous to the relationship that were present in transcripts from the early rounds of interviewing, had a role to play in service performance. The protocol was subsequently adjusted and the contingent factors were made part of the analytic 'story'."

To reinforce this we have supplemented the above text with the following:

"Their inclusion was necessary in order to understand the effect of relationship connectors on performance in this study context."

Secondly, to explain and justify the measure further, we have added the following text after the sentence "Thus, in this study context, PS penetration is a measure of how dependent a site is on Fortigo's product–service offerings for revenues" (3.4, point 2, p.10)

"This is in line with a long research tradition that measures dependence as the percentage of a company's business that comes from contracts with another company, and the size of the contribution that this makes to the former's profits (e.g. El-Ansary and Stern, 1972)."

It is unfortunate that we could not convince R1 that this measure is not an indicator of performance, is not in itself suggestive of service performance levels, and should not be conflated with what service performance is in this context (according to Fortigo, its service partners, and us). Just to reiterate, service performance is completely distinct to PS penetration and is measured across 5 KPIs, introduced, measured and recorded by the focal firm (Fortigo).

As a last attempt to satisfy R1 and R3 (and in particular R1s earlier concerns that practices, i.e. operational integration, would affect PS penetration [even though he or she considers PS penetration to reflect performance]) we have added an extra point to the reverse causality limitation in a parenthesis in the penultimate sentence of the text. It now reads:

[…] or whether there exist feedback loops between the different elements of the model (e.g. whether increased operational integration is conducive of higher PS penetration), was beyond the scope of the work.